

The Formation, Alteration and Preservation of Flood Deposits on the Pacific Northwest Continental Margin

Robert A. Wheatcroft
College of Oceanic & Atmospheric Sciences
Oregon State University
Corvallis, OR 97331
phone: (541) 737-3891 fax: (541) 737-2064 e-mail: raw@oce.orst.edu

Grant Number: N00014-99-1-0006

LONG-TERM GOALS

The ultimate objective of this research program is to obtain a predictive understanding of the physical and biological processes responsible for the formation, alteration and preservation of marine sedimentary deposits. The general approach of this research program is the development and testing of theory mainly through field observations and measurements.

OBJECTIVES

This is a proposal, within the STRATAFORM Shelf Program, to study the formation, post-depositional alteration and preservation of flood deposits on the Pacific Northwest continental margin. Five related activities are being pursued: (1) continuation of time series measurements of the areal distribution and small-scale properties of the 1995 and 1997 flood deposits, (2) statistical analysis of the small-scale spatial variability of flood bed thickness and geometry at stations K60 and S60, (3) x-radiographic examination of piston cores for past flood deposits, (4) testing of simple conceptual ideas of event layer alteration and preservation using the above data sets, and (5) examination of patterns of sediment accumulation and event layer preservation offshore of other Pacific Northwest rivers.

APPROACH

Box cores are the primary sampling device used in this research. Cores are taken in two different modes: (1) replicate time-series sampling of four stations along the 70-m isobath, and (2) broad, large-scale coverage of the Eel and other river-system margins. Subsequent sources of data include transmission x-radiographs, microresistivity profiles, profiles of the radionuclides, Pb-210, Cs-137 and Th-234, and macrofaunal community composition, abundance and biomass. In addition, box cores were collected offshore of several other major rivers in the Pacific Northwest (e.g., Russian, Klamath, Umpqua).

WORK COMPLETED

FY 00 was primarily an analysis and writing year with no field activities. Laboratory measurements primarily focused on completing Pb-210 and Cs-137 geochronology of cores from other Pacific Northwest rivers. Modeling the Pb-210 and Cs-137 data to account for the affect of deep mixing on sediment accumulation rates was also begun. Lastly, USGS sediment concentration data were used to calculate long term sediment loads for Pacific Northwest rivers.

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE SEP 2000		2. REPORT TYPE		3. DATES COVERED 00-00-2000 to 00-00-2000	
4. TITLE AND SUBTITLE The Formation, Alteration and Preservation of Flood Deposits on the Pacific Northwest Continental Margin				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) College of Oceanic & Atmospheric Sciences,,Oregon State University,,Corvallis,,OR,97331				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 4	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

During FY 00, I served as a guest editor for a special issue of Continental Shelf Research on Oceanic Flood Sedimentation (due out in late 2000). In addition, I convened a workshop on Shelf Sedimentation in July that was attended by roughly 30 STRATAFORM scientists..

RESULTS

New results in FY 00 have mainly involved our studies of sediment accumulation patterns offshore other Pacific Northwest rivers. We are testing two hypotheses: (1) sediment accumulation rate should scale directly with the magnitude of the sediment load of the adjacent river, and (2) there should be an asymmetry in the sediment accumulation pattern, with greater accumulation to the north. Figure 1 illustrates accumulation rate and river load data on the Eel and Russian margins. Surprisingly, despite a roughly 20-fold difference in annual river loads, the sediment accumulation rates are approximately the same. This result implies that the retention efficiencies of sediment on the two margins is drastically different, and indicates the importance of sediment redistribution processes in the coastal ocean (i.e., wave climate), as well as margin geometry in controlling sediment retention. The second hypothesis was largely supported, although large-scale coastal promontories (e.g., Cape Blanco) may complicate along-margin accumulation patterns.

IMPACT/APPLICATIONS

Documenting the initial distribution and subsequent modification of sedimentary event beds, as well as patterns of sediment accumulation will provide key insight for modelers of strata development on continental margins.

RELATED PROJECTS

Field sampling has been a joint effort with Drs. J. Borgeld (HSU), D. Drake (USGS), C. Nittrouer (UW) and C. Sommerfield (UDel). In addition, Chris Sommerfield (UDel) and I are collaborating on the studies of Pacific Northwest rivers.

REFERENCES

Sommerfield, C. K. and C. A. Nittrouer. 1999. Modern accumulation rates and a sediment budget for the Eel shelf: a flood-dominated depositional environment. *Marine Geology*, 154, 227-241.

PUBLICATIONS

Wheatcroft, R.A. 2000. Oceanic flood sedimentation: A new perspective. *Continental Shelf Research*, (in press).

Wheatcroft, R.A. Factors controlling the preservation of flood deposits on the northern California margin, *Journal of Marine Research* (sub judice).

Wheatcroft, R.A. and J.C. Borgeld. 2000. Oceanic flood layers on the northern California margin: Large-scale distribution and internal properties. *Continental Shelf Research*, (in press).

Wheatcroft, R.A. and C.K. Sommerfield. 2000. River sediment flux and shelf accumulation rates on the Pacific Northwest margin. AGU/ASLO Ocean Sciences Meeting, San Antonio, TX, January.

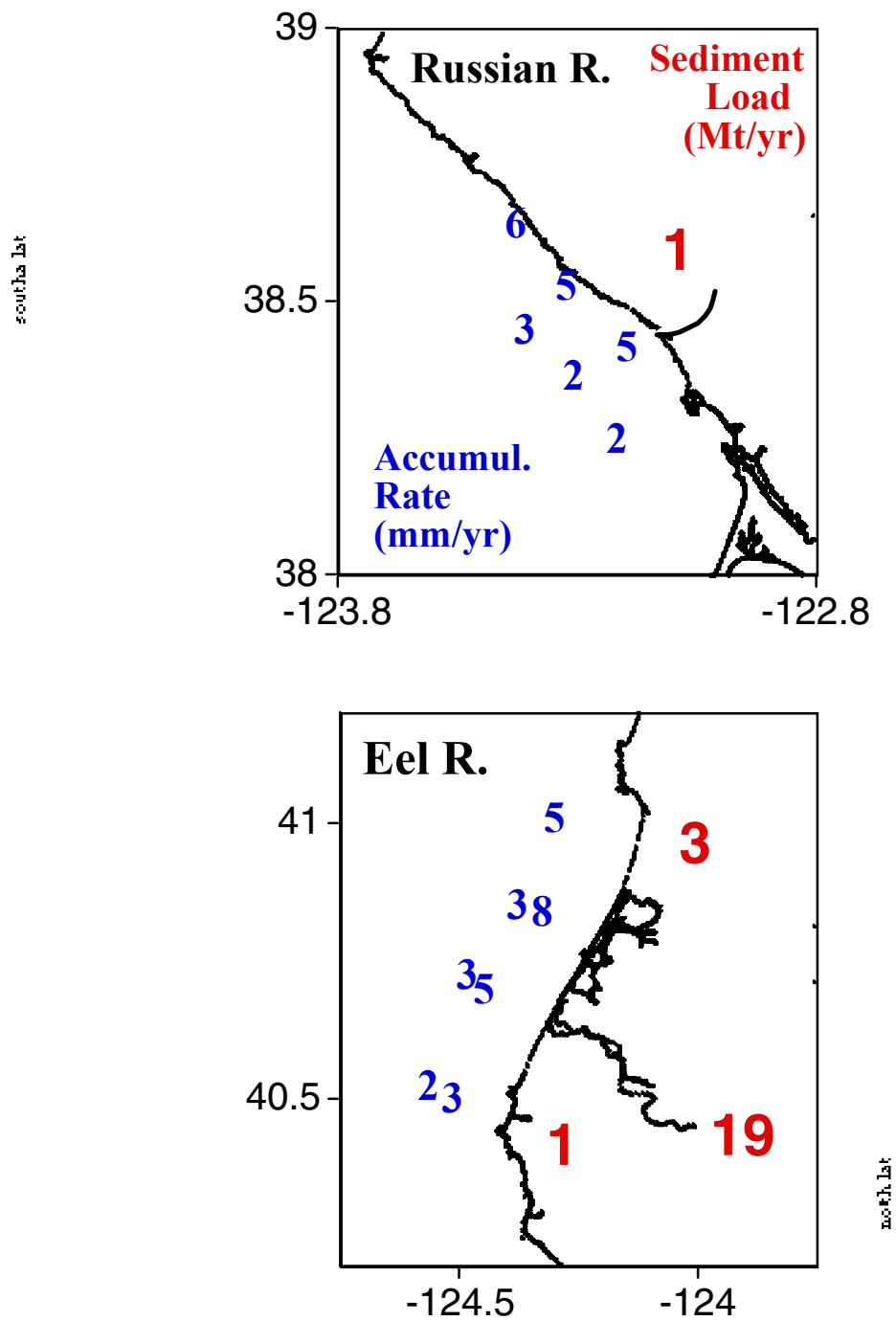


Figure 1. Comparison of shelf sediment accumulation rates and river sediment loads for the Russian and Eel River margins. Accumulation rates were measured at equivalent sites along the 70 and 110-m isobaths at spacings of 20 km off each river. The Eel accumulation rate data are from Sommerfield and Nittrouer (1999).